

MICHIGAN STATE UNIVERSITY

SHOCKWAVE ENGINE

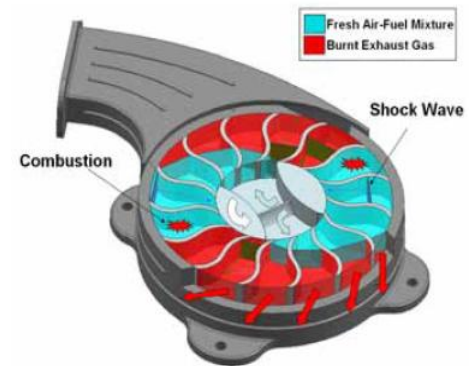
PROJECT TITLE:	Wave Disk Engine		
ORGANIZATION:	Michigan State University (MSU)	LOCATION:	East Lansing, MI
PROGRAM:	FOA1	ARPA-E AWARD:	\$2,540,631
TECH TOPIC:	Vehicle Technologies	PROJECT TERM:	1/14/10 – 7/15/12
WEBSITE:	www.arpa-e.energy.gov/ProgramsProjects/OtherProjects.aspx		

CRITICAL NEED

Most vehicle engines today are only 33% efficient, so there is a critical need to improve their efficiency. Developing more efficient engines could increase fuel efficiency—saving drivers money at the gas pump. It could also help limit U.S. dependence on petroleum-based fuels that produce greenhouse gas emissions like carbon dioxide (CO₂), which can contribute to global climate change.

PROJECT INNOVATION + ADVANTAGES

MSU is developing a new engine for use in hybrid automobiles that could significantly reduce fuel waste and improve engine efficiency. In a traditional internal combustion engine, air and fuel are ignited, creating high-temperature and high-pressure gases which expand rapidly. This expansion of gases forces the engine's pistons to pump and powers the car. MSU's engine has no pistons. It uses the combustion of air and fuel to build up pressure within the engine, generating a shockwave that blasts hot gas exhaust into the blades of the engine's rotors causing them to turn, which generates electricity. MSU's redesigned engine would be the size of a cooking pot and contain fewer moving parts—reducing the weight of the engine by 30%. It would also enable a vehicle that could use 60% of its fuel for propulsion.



IMPACT

If successful, MSU's redesigned engine would reduce the weight of vehicles by up to 20%, improve their fuel economy by up to 60%, reduce their total cost by up to 30%, and reduce their CO₂ emissions by 90%.

- **SECURITY:** Increasing vehicle fuel efficiency by 10% could result in 300 million fewer barrels of oil being imported from foreign countries each year.
- **ENVIRONMENT:** More efficient engines could result in the reduction of nearly 200 million metric tons of CO₂ emissions in the U.S. each year from passenger vehicles.
- **ECONOMY:** Reducing fuel waste results in cost savings for the average consumer, who spends nearly \$4,000 a year on energy.
- **JOBS:** Improving the efficiency of internal combustion engines to meet federal guidelines by 2030 will require a substantial commitment of highly skilled laborers trained in construction, manufacturing, and engineering.

CONTACTS

ARPA-E Program Director:
Dr. Eric Toone,
eric.toone@hq.doe.gov

Project Contact:
Dr. Norbert Mueller,
mueller@egr.msu.edu